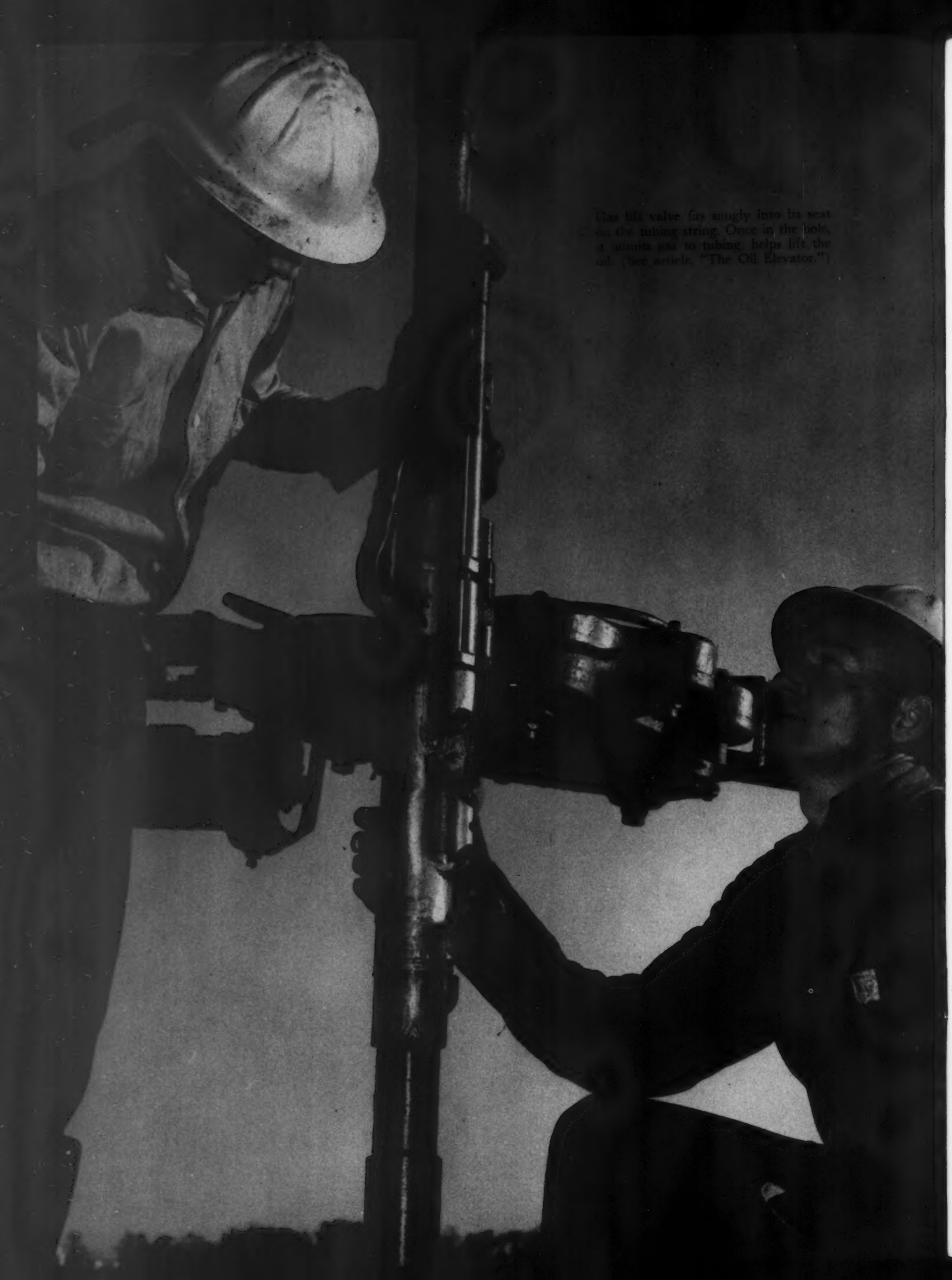
Presidio La Bahia — *E. M. Schiwetz*

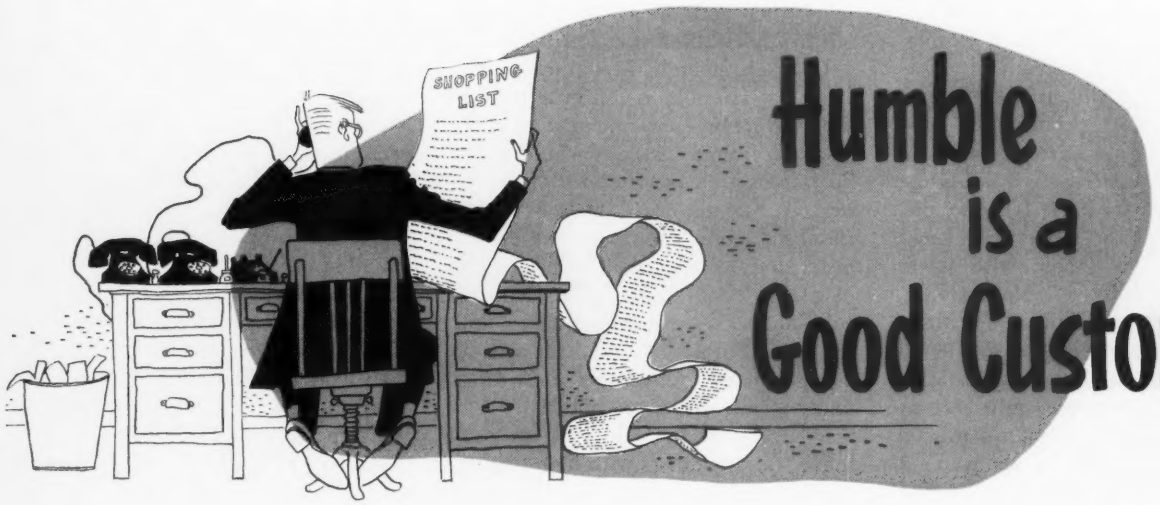
The HUMBLE WAY

NOVEMBER-DECEMBER, 1952



Gas lift valve fits snugly into its seat on the tubing string. Once in the hole, it admits gas to tubing, helps lift the oil. (See article, "The Oil Elevator.")

The HUMBLE WAY
NOVEMBER-DECEMBER, 1952
Vol. VIII No. 4



Humble is a Good Customer

EVERY working day, Humble spends almost half a million dollars on the things it needs to carry on business.

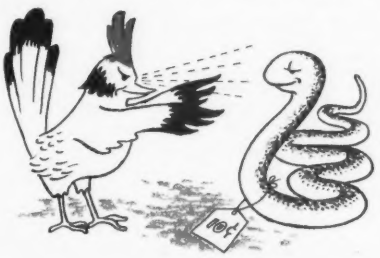
Even in these days of inflation, with the public mind numbed by multi-zeroed figures, that adds up to a king-sized shopping bill. Some $120 million worth of purchases found their way into Company market baskets during 1952. Almost that much was bought the year before, and the year ahead looks like an even bigger buying period for Humble.

Where does the money go?

It goes for just about everything under the sun. Look at Humble's yearly shopping needs and you'll find a list 75,000 items long, from drill pipe to canary birds. (The latter do not brighten employees' parlors; they are sensitive "gas detectors" in danger areas).

Now and then, a perplexed purchasing agent has to check up on an order, just to make sure someone hasn't had a mental lapse. Take that order, some time ago, for rubber snakes. What on earth could an oil company do with rubber snakes? Create havoc among women and children at a Company barbecue? Nothing so barbarous; someone thought the latex reptiles might prove lifelike enough to keep pesky woodpeckers from perforating expensive wooden poles and piling. It was a noble (and inexpensive) experiment—but it didn't work. The wily birds weren't fooled for a moment.

Sometimes an idea that appears to be utterly ridiculous serves a perfectly



valid purpose. A case in point was a Baytown Refinery order for *snowshoes*. It snows at Baytown about once in every ten years or so. But these snowshoes were put to work at once by men spreading catalyst — the fine white powder that helps "crack" oil molecules.

You don't spend much money on snowshoes, canaries, and rubber snakes. Money-wise, they are the drop that gets lost in the ocean. Items that take big money out of the till are tubular goods, around $30 million a year; chemicals, $12 million; drilling equipment, including bits and tools, $5 million; and so on.

With a big market beckoning so invitingly, you'd expect to see hundreds of salesmen beating a path to Humble's door. And you'd be right. Every Monday, Wednesday, and Friday at the Main Office in Houston, Humble buyers see an average of about 100 local salesmen a day. Out-of-town salesmen

get an audience any day—and department policy sees to it that no salesman is kept waiting any longer than absolutely necessary.

How far does Humble spread its business? In 1951, the last year for which figures were complete as this was written, the Company bought from almost 4000 firms all over the country. Wherever possible, though, Humble stuck to its policy of buying from firms in areas where the Company operates.

To cite a case, Humble buys from 1000 to 1500 cars a year. It could buy them all from a single dealer, but it doesn't. To spread its purchases fairly, Humble buys cars all along its belt of operations, from California to Florida.

Just as Humble spreads its purchases geographically, it also spreads them among all sizes of suppliers—big industries, medium-sized companies, and small businesses, right down to the one-man shop. In 1951, for example, more than half the money was spent with small firms (those with fewer than 500 employees). Numberwise, more than 90 per cent of the firms from whom Humble buys are small firms.

In 1951, for example, only 18 suppliers got Humble orders for a million dollars or more worth of goods. That makes the Company a mighty good customer of so-called "small business."

Humble buyers greet with delight two current trends in business. One is

the gradual change from a sellers' to a buyers' market. The other is a gradual lifting of government regulations and controls. The first often made it difficult to buy some things at all; the second added a mountain of paperwork to the task. It is a safe bet that buyers the country over will shed no tears when both are no longer trends, but firmly established conditions.

Logically enough, most of the money spent by Humble is for orders from the Production Department. You'd expect that from a company whose major operations are concerned with producing oil. Staying with the year 1951, the Production Department placed orders for more than $66 million worth of goods. About half of that went for tubular goods—drill pipe, casing, and the like. Purchases for that type of equipment go up as drilling goes deeper and becomes more complicated.

Pointing up the high cost of providing oil consumers with high quality products, purchases for the Refining Department in 1951 totalled more than $23 million. Nowadays, it costs upwards of $5000 to provide a single barrel of refining capacity—and the cost is still rising. New refining units and tools, chemicals and supplies, and all the other things it takes to keep an oil refinery going come pretty high these days.

As Company people are proud to point out, Humble in 1951 became Texas' leader in tax-paid gasoline sales. This upsurge in sales was logically followed by a high level of purchases for the Sales Department, which placed some $6 million worth of orders that year.

With so many different things to buy, no one buyer or group of buyers could possibly handle the whole job. Humble's Purchasing Department is divided into six buying divisions—each manned by a buyer and at least one assistant. For convenience, and to allow some semblance of specialization, each division is responsible for purchasing goods from a related family of products. One buys stationery, printing, office supplies, and related merchandise. Another buys pumps, compressors, engines, and electrical material. So it goes—all of the thousands of items fall into one or the other of the six buying divisions.

In addition to the buying divisions, the Department has set up two service divisions—and neither finds too much time on its hands. One is the invoice-record division, which handles some 1400 invoices a day. The other is the follow-up division, whose job it is to

HUMBLE

Purchasing Policy

WE DESIRE PERMANENT trade connections with reputable sellers.

Consideration is given to

1st Quality
2nd Service and Delivery
3rd Price

SELLER'S INITIAL PRICE should be rock-bottom, promptly submitted. There is seldom opportunity to revise price and in case of revision other bidders should be given similar privilege.

QUOTATIONS submitted will be considered strictly confidential both before and after business is placed.

From the seller, as well as the personnel of the Purchasing Department, we look for the STRICTEST HONESTY and STRAIGHTFORWARDNESS in all dealings, complete SATISFACTION of PROMISES or REPRESENTATIONS made.

CONCERNS NOT COMPLYING WITH THESE STANDARDS WILL BE PROMPTLY ELIMINATED FROM OUR LISTS.

Humble Oil & Refining Company
PURCHASING DEPARTMENT

see that orders have been properly filled and shipped and will be received where and when the material is needed.

Now and again, something disrupts the steadily efficient flow of a follow-up man's life on the job. One day, a call came from a chemical company. Was Humble *sure* it wanted so much of a certain chemical?

"Why?" the follow-up clerk wanted to know.

"Do you have any idea what an *ounce* of that stuff costs?" came the counter-question, followed by an eyebrow-raising price.

By now, Humble scented trouble.

"How much did we order?"

"Oh—just a mere 20,000 gallons," came the gleeful reply.

It turned out the order was supposed to be for 20 gallons. Some machine had stuttered out too many zeroes.

There was the time when someone from the field wrote in, asking that a Christmas tree be ordered. Christmas trees are those complicated assortments of pipes and valves that control flow from oil wells. But the man reached by the request was new, and a serious-minded chap about his work. He wrote back that, in his opinion, business correspondence was no place for foolishness!

Then there was the time when a shipment of 50,000 Humble paychecks (blank ones) went momentarily awry. While visions of forgers danced in their heads, a platoon of follow-up men dropped everything and went frenziedly to work on that one. To the relief of all, the blank checks were found before any harm was done. It was the first (and last) time a batch of Humble checks wandered off the beaten path.

Patterns of buying have changed, to suit an inventive industry. Ten years ago, Humble wouldn't have been in the market for microwave equipment, if indeed there was any being sold at that time. Just recently, it equipped hundreds of miles of pipe line with microwave, to insure steady service in bad weather that breaks down ordinary communications.

Other "new" items have found their way into Humble's shopping baskets in recent years. Many of them are in the field of electronics, such as radar for storm warnings and specialized electronic devices for oil finding.

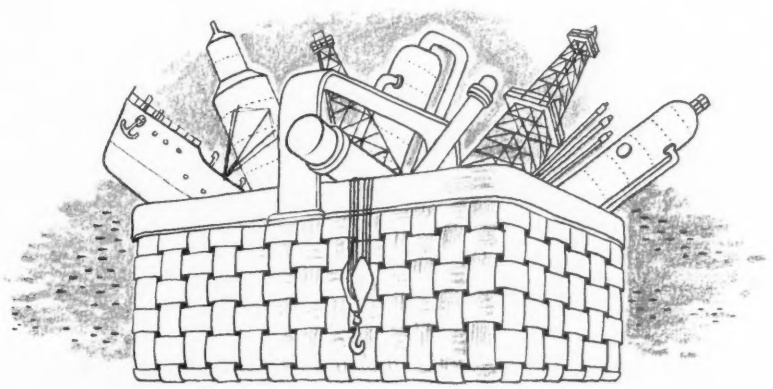
But no matter how times change, Humble's basic buying philosophy remains steadfast. In the eyes of the Company's buyers, no deal is a good deal unless both buyer and seller benefit. There is neither the time nor the inclination to haggle over prices. As the Purchasing Policy sets forth, "Seller's initial price should be rock-bottom, promptly submitted. There is seldom opportunity to revise price and in case of revision other bidders should be given similar privilege."

Most salesmen admit openly and frankly that they "like to do business with Humble." A chance statement from the Purchasing Agent tells clearly why that is so.

"Someone once called me," he reflected, "and asked if he could come up and see me about his product. I told him to come anytime. Then he hesitated and asked another question:"

" 'Do you folks just do business with your friends?' " the salesman inquired.

"The only reply I could think of to a question like that was: *All* salesmen are our friends!"



The Oil Elevator

Lease pumper winds the clock of a surface controller, a device which is sometimes used as an automatic starter (and stopper) for the oil elevator known as gas lift.

Gas lift uses expanding bubbles to give sluggish fluids a ride from nature's basement to the aboveground market

TO SHOW his faith in the lever as a mechanical device, Archimedes, the Greek scientist, once said: "Give me a place to stand and I will move the earth."

A modern engineer might very well paraphrase that ancient boast by saying: "Give me enough compressed air or gas, and a storage place, and I'll empty an ocean."

The latter experiment, like that of Archimedes, would require only a proper utilization of natural forces. The engineer would simply enlist the same type of energy which causes a bottle of seltzer water to spew out its contents. Bubbles of expanding gas, unleashed in a submerged flow tube, would bring the water surging forth.

In the oil industry, this technique is widely used under the name of gas lift. For boosting large volumes of fluid to the surface at a rapid rate it has few equals among the many methods of artificial recovery. Since its introduction to the oil fields of Pennsylvania in the early 1860's, it has been the elevator which has lifted huge quantities of oil from petroleum's basement warehouse to the aboveground market.

Gas lift works on a very simple principle. It simulates the natural flow of an oil well by injecting compressed gas into a column of inert fluid. The gas expands and starts fizzing upward, thereby performing feats of levitation which rival those of the most accomplished magician.

Take the case of a typical gas lift prospect, that of a once-flowing well which has lost much of its formational energy. The oil still migrates to the well bore and rises part way up the tubing, but the producing reservoir lacks the power to kick it on to the surface. If plenty of gas is available in the field, gas lift may be decided upon

as the most economical method of artificial lift.

The decision made, a workover crew moves into action and pulls the tubing from the hole. One or more pressure-operated valves are added to the tubing string. These valves are usually so placed that, back in the hole, they are located below the standing fluid level. Compressed gas is then forced down the casing and released into the tubing through the valves. There, in an area of reduced pressure, the gas expands and heads for the surface. In so doing, it aerates the fluid column, lightening it enough to provide a constant flow as long as the gas is kept surging in.

Another form of gas lift offers intermittent flow. The oil is allowed to collect in an accumulation chamber at the bottom of the hole, and then gas is injected in periodic spurts. The shots of gas work like pistons: Each injection of gas "slugs" ahead of it a charge of fluid.

Along the Gulf Coast, where water infiltration is a common problem, gas lift has given many a water-logged well a new lease on life. Since water is heavier than oil and since it contains no gas in solution, considerably more energy is needed to raise a mixture of oil and water than is needed for oil alone. If the formation lacks this reserve of energy, the well goes dead.

Let's take a hypothetical case: Suppose, for instance, a well has 300 cubic feet of gas dissolved in each barrel of its oil. This may be enough to lift the oil, and the well flows naturally. But let the well start making water, and the amount of gas per barrel of fluid is sharply reduced. Natural flow ceases. Install gas lift and the energy deficiency is corrected. The well again starts producing.

Success stories in this vein have been written time and time again in such Gulf Coast fields as Goose Creek, Conroe, Humble, West Columbia, and Friendswood. The technique has also done yeoman service in the Mid-

Workover crew, pulling tubing, breaks loose a joint holding a gas lift valve.

Gas lift valves shown here in jewel-box array are a few of the many sizes and types needed to cope with the fickle pressures of oil reservoirs. Some gas lift valves are designed to provide a constant flow of fluid. Others provide an intermittent flow.

Gas lift valve usually rides piggy-back on tubing string, being mounted on a short section of pipe called a mandrel. Lugs keep valve from being banged against casing.

Service man checks valve for proper pressure setting before installing it in well. Valves are set to open at a certain pressure, to close as pressure is decreased.

Continent fields—Smackover in Arkansas for one example, Seminole in Oklahoma for another. At Seminole, in the hog-wild days before conservation laws took effect, gas lift was sometimes used even in natural-flow wells as a goad to higher output.

Gas lift's biggest rival is the pumping unit. The sharp pencil of economics determines which wins out in a given field, but all other things being equal, gas lift claims several advantages: For one thing, the investment required is relatively low. Its lift capacity is greater than that of a pump. And it takes in stride the crooked holes which are so destructive to a pump's sucker rods.

For many years, gas lift was looked upon as only a stop-gap measure to be used between the time a well stopped flowing naturally and the time that it had to be put on the pump. Modern gas lift, however, has been developed to a point that it can usually carry a well to depletion. In fact, Humble makes that a prerequisite of any new gas lift program: The wells must be suited to full depletion with this method.

Humble today has more than 11,000 producing wells. Of these, about 10 per cent are on some form of gas lift.

Gas lift, under that name, belongs to the Twentieth Century, but under the name of air lift it has a family tree whose roots lie in antiquity. Heron of Alexandria, a Greek scientist who flourished a century or two B. C. (the dates are hazy), turned out a book called *Pneumatica* in which he described in considerable detail a simple form of air lift. Known as Heron's Fountain, this device remains the first known application of compressed air to the lifting of water.

NOT for some eighteen centuries were the principles outlined by Heron put to productive use. In the late 1700's, however, air lift was revived in an improved version when European mining engineers started using it to empty water from flooded mine shafts. Other mine operators adopted the technique, and soon air lift had spread to most of the civilized world. In Globe, Arizona, for instance, air lift was used to clear the Old Dominion mine of 40 million barrels of water in just six months.

Trail-blazing oilmen in the Pennsylvania fields were not long in taking a

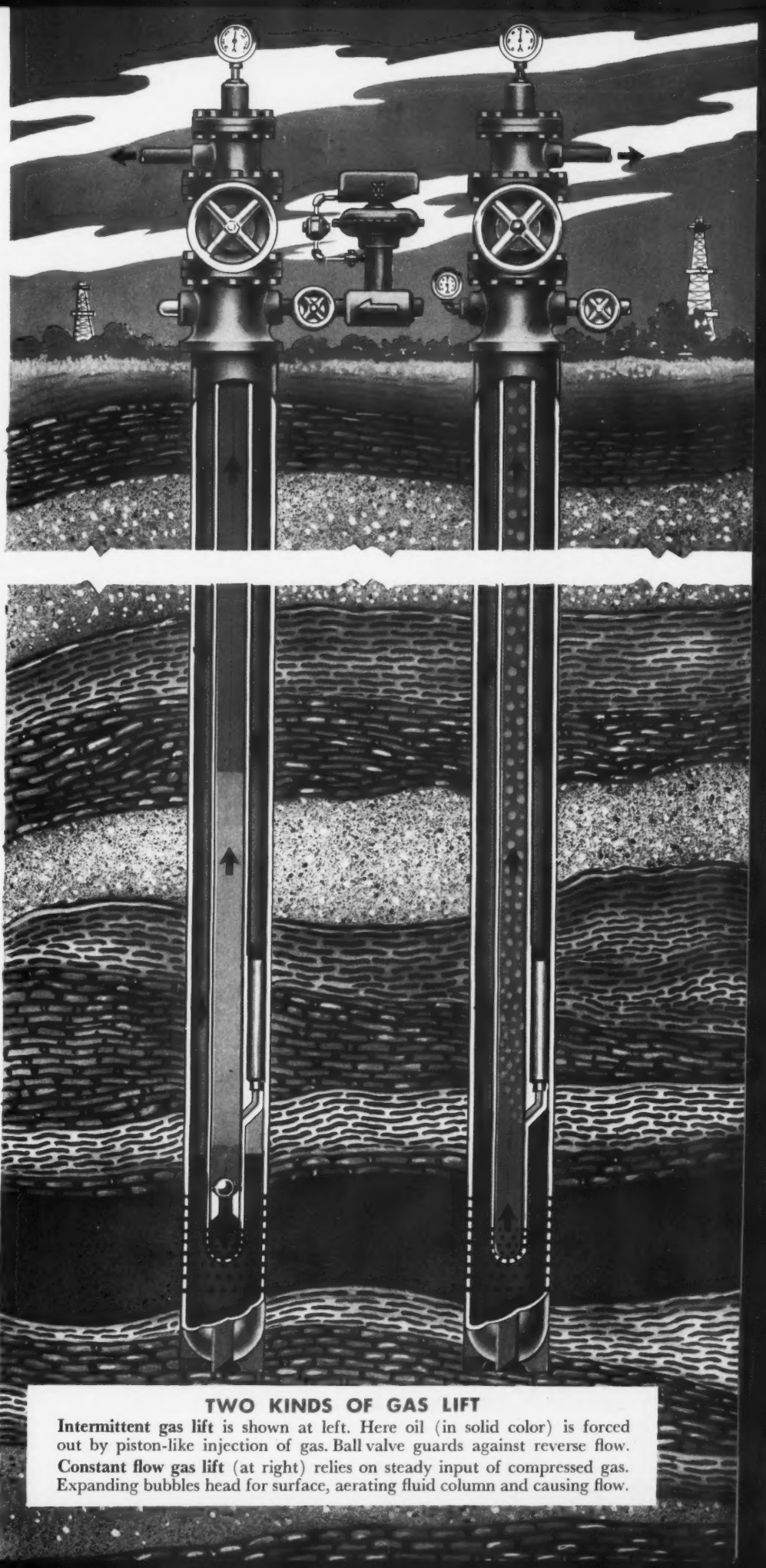
leaf from the miners' book. They tried air lift on moribund oil wells in the early 1860's, and it worked. Not until after Spindletop, though, did air lift really win its spurs. Huge air compressor plants became a fairly common sight in the early fields along the Texas Gulf Coast. Air lift spread to California around 1909, and by then natural gas was occasionally being substituted for air as the lifting medium. By the early 1920's, gas lift had definitely won out over air lift. For one thing, strange as it may seem, gas was safer to use than air. Nor did it present the problems of corrosion that air did. Usually, too, gas was readily available under a pressure which was sometimes adequate without further compression. In any event, it was easier to compress than air.

IN THE early days, the gas was simply rammed down the casing annulus and kicked around the bottom of the tubing. But since this method involved a tremendous amount of pressure, oilmen started looking for a way to introduce the gas into the tubing at a point higher up. Gas lift valves proved to be the answer. These were attached to mandrels (special joints of tubing pipe), and from one to a dozen or more were added to the tubing string. The number of valves varied—and still does—with the amount of lift needed.

A simple "pop valve"—one whose flow port popped open when the gas reached a certain pressure—was the first type to be put into service. Today's valves are much more complicated. Some can be controlled from the surface through pressure variations. Others react to the pressure differential which exists between the casing and the tubing.

The capabilities of modern gas lift run an impressive range. It is currently being used in wells as shallow as 700 feet, as deep as 13,000. And it can be profitably employed in wells which produce as little as three barrels a day or as much as several thousand.

Because of gas lift and the other means of artificial recovery, today's oil well has more lives than a cat. Often in its case, death isn't necessarily fatal. To see that this happy paradox continues, thousands of oil industry technicians, among them many gas lift engineers, are constantly seeking to improve old methods and to devise new and better equipment.



TWO KINDS OF GAS LIFT

Intermittent gas lift is shown at left. Here oil (in solid color) is forced out by piston-like injection of gas. Ball valve guards against reverse flow. **Constant flow gas lift** (at right) relies on steady input of compressed gas. Expanding bubbles head for surface, aerating fluid column and causing flow.

COMPLETING WELLS FOR KEEPS

A javelin-sized perforating gun unlocks the door to a revolutionary new method of completing wells

ON A BRISK autumn day two years ago, in the Hoffman Field of Southwest Texas, a small group of engineers and production men pressed around a Humble well site to watch the field test of a new perforating gun.

This was no routine experiment: Much more than a gun was being tested this November day of 1950. Also on trial was a revolutionary method of completing an oil well—one the engineers had dubbed a permanent type well completion.

The proposed technique called for setting the tubing and wellhead in place only once during the life of a well. All completion and workover chores would thereafter be performed *through the tubing* with a variety of ingenious wire line tools, the first of these to get a tryout being this new perforating gun.

Here was a radical departure from usual oil field practice. To understand its full import, one needs to know that two of the most dollar-devouring phases of oil production are: (1) the well completion, which involves all operations after the pay zone is reached, and (2) workovers, all subsequent jobs aimed at restoring or increasing production.

The former, it has been estimated, eats up about 20 per cent of the total well cost, the latter an additional 25 to 50 per cent.

Why so expensive? Well, one big reason has always been that, whether you were completing a well or just working it over, you needed a rig on hand to shuttle tubing in and out of the hole. Then, too, where the formation pressures were high, you usually had to keep the well full of mud while you worked—another costly item.

Humble's petroleum engineers, however, envisioned something entirely different. After an oil sand had been

Rigging a well for new perforating gun requires only a sheave and lubricator.

Wiring shaped charges in gun is simple job which can be completed at wellhead.

Lowering gun into well is one-man job since gun shown weighs only 37 pounds.

drilled through and cased off, they proposed setting the tubing permanently just above the pay zone. The rig could then be moved off—for good. From there on, everything would be done with tools lowered on a wire line through Christmas Tree and tubing. As for workovers, no rig at all would be needed—only a gin pole or something similar to support the wire line and its tools.

ON COMPLETIONS, the engineers figured, up to two days of rig time (at $1000 to $2000 a day) might be saved. On some types of workovers, cost might be sliced in half. And perhaps of even greater importance over the long haul, both types of jobs could be done without killing the well with mud. This might very well help reveal striking new information about the behavior of oil reservoirs.

Said one engineer of the latter: "Our gains in more accurate reservoir information could prove to be of even greater value in oil recovery than the reduced costs for completions and workovers."

That's the way things stood on November 8, 1950.

It all looked good on paper, but could the new technique make the crucial leap from theory to practice? If so, the long range benefits could be tremendous in terms of more oil at less cost. But success of the entire project hinged on the new gun.

Was it possible to perforate casing with tubing in the hole? If not, there could be no such thing as a "permanent type" well completion. You would always have to move in a rig and pull tubing to handle this simple job.

To those who looked over this new gun for the first time that day at Hoffman Field, it seemed to bear a close family resemblance to any other jet perforator. Spiraling down the length of its seven-foot body were 35 gunports, five to the foot, and each loaded with a power-packed shaped charge. It might have been just another cousin of the war-famed bazooka which had been domesticated and turned to peaceful pursuits.

One startling thing about this new gun, however, was its size. Its over-all diameter spanned only one and three-quarter inches. It had to be that small, of course, if it was to pass through two-inch tubing, but to some field veterans, undertaking a perforating job with so puny a weapon was a little like trying to pot an elephant with a pea-shooter.

THERE was something else about the gun which was obviously out of the ordinary: Its body was made of an aluminum alloy instead of steel. The reason for this? It was so the gun would disintegrate after firing and fall to the bottom of the hole. Only the magnetic casing collar locator (a device for accurately placing the gun opposite the desired pay section) and the firing head would have to be pulled from the well.

A lubricator (or piece of pipe long enough to encase the gun) was screwed into the top of the Christmas Tree. Its purpose: to trap any well pressures which might try to escape. Built into this device were a stuffing box with rubber packing to fit snugly around the 3/16-inch electric cable, a blowout preventer, and a crank-operated cable feeder for forcing the gun through the Christmas Tree.

Dangling from its cable, the gun was reeled nearly half a mile down the tubing and out its open end to a point opposite the oil sand. A technician closed a switch and an electric impulse raced down the line, triggering the shaped charges. Thirty-five spurts of explosive energy ripped into the casing. A short time later, after a bit of swabbing, the well started flowing.

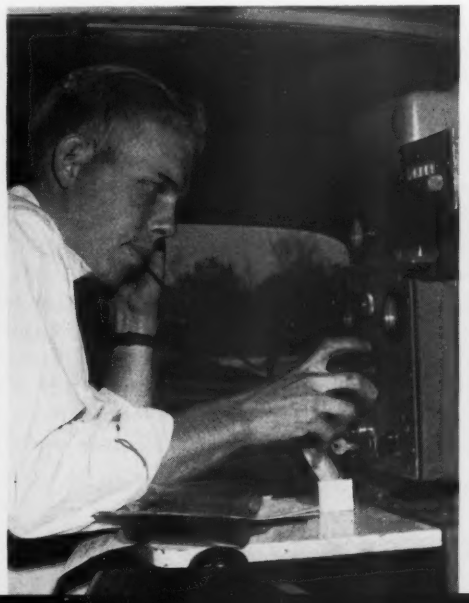
UNHEARD by human ears, this scattergun blast into the Hoffman Field reservoir signaled the end of a most successful experiment. It also marked the opening of a new frontier of oil recovery. For the first time, it was now possible to gun-perforate the casing without killing the well or pulling the tubing. Permanent type well completion was over its first big hump.

Since then, Humble has shot more than 200 wells with through-the-tubing guns. And the results, in most cases, have been of the kind to gladden the heart not only of a production engineer but also of a cost accountant.

In an 8000-foot Frio sand reservoir of Southwest Texas, for instance, Humble re-perforated three wells last year to increase oil production. The average cost per well, using a conventional gun-perforator, was $4450. Recently, in the same field, the new gun was used to re-perforate five wells at a cost of only $1160 a job. That's a 75 per cent cut in costs!

Checking instrument panel for correct placement of gun is vital part of job.

Firing takes place as shooting specialist twists knob to release electric impulse.



Reeling in wire line, crew prepares to button up another successful assignment.

Up from the depths come firing head and collar locator—all that's left of gun.

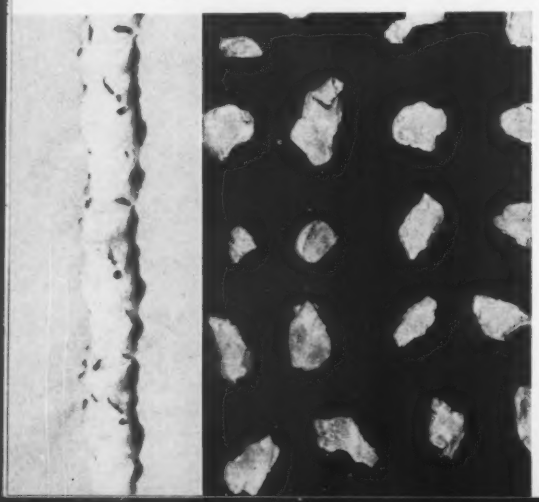
Nor have such tangible, easily calculated savings been the only boon:

At Friendswood, near Houston, workover crews formerly had to perforate with mud in the hole. Often the shots rammed the viscous fluid back into the formation, clogging the sand pores and making it difficult to restore flow. That's no longer true, now that the wells can be shot with just oil or salt water in the hole.

In the Stratton Field, one to four days of clean-up time used to be about par after a perforating job. Now Humble is getting the oil into stock tanks only one or two hours after shooting a well!

From the standpoint of reservoir engineering, the gun performs another important service. A sand, for example, may have variable permeability from top to bottom. With this gun, you can perforate selectively—one section at a time—and thus measure quite accurately the producing characteristics of each portion of a formation. The cost is low since the well need not be killed nor the tubing pulled between shots, but more important than that, the knowledge gained may lead to a much greater ultimate recovery of oil.

Sieved tube (left) shows how gun body looks after firing. This disintegrates into fragments like those shown at right.



SELECTIVE perforating also enables the engineers to determine actual gas oil or water oil contacts under flowing conditions. Thus the gas-oil ratio—a factor which may govern the amount of oil a well is allowed to produce—can be kept at the best possible level.

One reservoir engineer sums it up this way: "Up to the present, we have had to rely to a considerable extent on trial and error in diagnosing and handling well problems. Now we're approaching a more scientific and precise method of handling these problems."

But gun-perforating is just one aspect of permanent type well completion. What about the many other operations which enter into the completion of a well—cement plugbacks, say, or squeeze cementing? What about putting the well on artificial lift? These are some of the other problems involved in permanent type well completion, and development work on these is still in progress. The results so far, it may be added, have been highly encouraging.

Take cement plugbacks, for instance. Sometimes a well will start making water in the lower part of a producing formation. By plugging the trouble spot with cement, such water infiltration can often be stopped cold. The well can then be re-perforated in a higher zone and production restored.

There was one big hitch: Under this new method of well completion, the tubing ended *above* the producing formation. How were you going to spot the cement exactly where you wanted it if the tubing ended perhaps a hundred feet above the water-invaded section? The engineers solved this problem with a wire line tool called a retrievable tubing extension —a piece of one and a quarter-inch pipe which can be run down the tubing, telescope fashion, and locked into place in a landing nipple. Since the extension can be just as long or as short as you want to make it, the cement plug can be rammed home in exactly the right spot.

Humble has already chalked up several successful plugbacks with the tubing extension. It is currently testing the tool on squeeze cementing—those jobs where cement is squeezed through perforations to shut off the unwanted gas or water.

Squeeze cementing poses problems aplenty: Special rubber packers which seal against a wide range of pressures must be developed for use with the tubing extension. Also required is a lightweight, easily pumped cement—one which won't "flash set" before the job is completed. Humble's engineers believe, however, that these problems are wobbling and about ready to topple and be counted out.

Humble is also testing the tubing extension on wells which become "loaded" with sand. It wants to see if it can circulate fluid down the casing and back up the tubing extension and thus wash out the sand.

BUT what about artificial lift? When natural flow stops, how are you going to put a well on artificial lift without pulling the tubing? After all, artificial lift—no matter what form it takes— requires some sort of equipment down in the hole, and tubing gives you only two inches of elbow room. Here is a tight squeeze which would tax the ingenuity of even a Gib Morgan, who, legend has it, once brought in a shrinking-hole well with needle and thread.

The engineers believe, however, that there is a way out of this dilemma: gas lift. Their plant is as simple as this: Before setting the tubing, blank gas lift valves will be locked inside the pipe. When artificial lift is needed, these blanks will be lifted out by wire line, then replaced with real valves. Gas lift equipment of this type is already undergoing rigorous field tests.

All in all, then, the frontier opened by the tubing gun is rapidly being explored. Almost every week, in one of Humble's fields, another excursion is made into this promising sector of technology. The day grows steadily nearer, our engineers believe, when permanent type well completion will be added to the Company's standard operating procedures.

THE GOLIAD TRINITY

Goliad and its environs were battlegrounds in the struggle for Texas long before time ran out on Fannin and his martyred men

ON THE San Antonio River, less than 50 miles above Copano Bay on the Texas coast, lies historic Goliad. Just between the town and the river glows the restored magnificence of an old Spanish mission, Nuestra Senora del Espiritu Santo de Zuniga. And Presidio La Bahia, a fort built two centuries ago, frowns down from its rocky height across the river.

These three—Goliad, the mission, and the fort—form a trinity famous in Texas history.

Spain in Texas

Long before Goliad was to make its mark in the struggle for Texas freedom, the mission and the fort figured strongly in Spain's effort to colonize the American Southwest. While the friars of Espiritu Santo went about their work of converting and civilizing the Indians, La Bahia's function was to prevent Indian uprisings and protect the region from possible encroachment by the French and English.

Though Goliad was not founded by Mexican decree until 1829, events that led to that founding began back in 1749. In that year, Captain Orobio y Basterra, of the Army of New Spain, searched with a small body of troops for a better place to locate Presidio La Bahia. The fort and its attendant mission then lay at Mission Valley, near modern Victoria.

Both the presidio and the mission had first been established in 1722 on the site of La Salle's Fort St. Louis (possibly on Garcitas Creek) on the Texas coast. Incessant trouble with Indians, however, made it advisable to move farther inland in 1726 to a location on the Guadalupe River, known as Mission Valley. After 23 years at Mission Valley, Governor Jose de Escandon had ordered a better location to give greater protection of Spanish interests in Texas.

Obedient to Escandon's orders, Basterra and his troops set out from Mission Valley in 1749, moving cautiously across the wild plain, ever alert for marauding Indians. Coming at last to the San Antonio River, the little party crossed in canoes and clambered atop a rugged hill on the opposite bank. Basterra, perched on the rock-ribbed summit, appraised the location with military eye. Here was what he sought: tactical advantage against assault combined with a nearby supply of water. He lost no time surveying the place and staking out a huge quadrangle.

La Bahia had a new home.

Gibraltar of the Southwest

What Gibraltar is to the Mediterranean, La Bahia was to Spanish rule in Southwest Texas. From its founding, the fort was a rock around which ebbed and flowed the fierce tides of war. It seemed destined to become a place of violence, a magnet to attract political plots and counterplots. Long before it played its part in the Texas Revolution, La Bahia was a veteran of assaults and skirmishes, its walls breached and scarred by scores of battles that had swirled around them. And always, La Bahia survived.

Most of the early fort's leaders had dispositions to match the ruggedness of the rock they commanded. There was the slave-driving martinet, Francisco Tovar, who insulted and abused even the priests at nearby Mission Espiritu Santo.

Mission Espiritu Santo de Zuniga.
Goliad Texas

Fannin's Grave, Goliad *by E. M. Schiwetz*

There was the crafty Carzola, who lured into the walls and killed an Indian chief. The chief, named El Mocho (The Maimed) for an ear lost in battle, had been stirring up rebellion among his people. Only one commander, Capt. Manuel Ramirez de la Piszina, who had succeeded Basterra, was remembered with real affection among his people.

Under such leadership, discipline sagged and morale suffered. Captain Juan Cortes reported in 1795 that he had eight cannon, but not a soldier in the garrison knew how to fire them. When, under his successor, soldiers tore down a portion of the wall, men found guilty of gambling were ordered to work out their fines by rebuilding the wall. It was not until the end of the 18th century that La Bahia reached full strength behind strong fortifications.

Gutierrez and Magee

Those walls were soon to be tested by their first full onslaught. Revolt against Spain had been brewing for some time, and in 1812 an expedition of some 300 adventurers under Gutierrez and Magee was formed to overthrow Spain and make Texas a free nation. Marching to La Bahia, the expedition took over the fort and prepared to defend it against certain reprisal from Spanish forces at Bexar.

Attack was not long in coming. Salcedo and Herrera,* with some 2,000 Spanish troops, marched from Bexar and placed La Bahia under siege. Without water, and dispirited by the death of Magee three months after the siege began, the filibuster army asked to talk terms.

A parley was arranged between Gutierrez and the Spanish commanders. Terms of surrender proved unsuitable to the besieged leader. He rejoined his men inside the fort, took the offensive, and routed the King's troops. In the pursuit that followed, Gutierrez captured the Spaniards and had one of his subordinate officers murder them soon after. This act caused many Americans to desert the expedition. Gutierrez himself was court-martialed and relieved of command.

Later, a revengeful force under Arredondo caught up with and wiped out the remaining insurgents. Remnants of the defeated army escaped and made their way back to La Bahia, only to be shot there by former comrades-in-arms who had remained behind and had, with change of heart, declared themselves for Spain.

Perry and Long

One soldier who escaped the battles of the ill-fated Gutierrez-Magee Expedition returned another day to fight at La Bahia at the head of his own troops. In 1817, Henry Perry had joined forces with Aury and Mina to fight in Mexico against Spain. Perry organized a body of soldiers, withdrew from action in Mexico, and marched to La Bahia. His assault against the fort was about to succeed when Spanish reinforcements arrived. Finding himself surrounded and his case hopeless, Perry shot himself with his own weapon rather than be taken prisoner.

Another soldier of fortune—James Long—had visions of taking La Bahia by storm. In the fall of 1821, he and his troops numbering some 50 to 60 men set sail from Galveston and landed at the mouth of the Guadalupe River. They marched to La Bahia, surprised the small garrison, and took possession of the fort.

Long's stay was short. Spanish troops were dispatched immediately from Bexar, and Long met them under a flag of truce midway between the mission and the fort.

Truce talks came to naught, and Long returned to La Bahia to prepare for a siege. It was a short one. Within 24

* Manuel Maria de Salcedo, Governor of Texas, and Simon de Herrera, Governor of Nuevo Leon.

hours, Long had surrendered with all his men. He was taken to Laredo and thence to Mexico City, where he was released—only to be "accidentally" killed by a sentry.

Origin of Goliad

In 1821, Mexico won its independence from Spain. For a time, garrisoned by soldiers of the new Mexican Republic, La Bahia was to know a kind of peace that had been denied it for many years.

After a few years, those living in the *pueblo* (town) around La Bahia thought it well to change the name of their place. The local *ayuntamiento* (governing body) met and, through Rafael Monchola, petitioned the State of Coahuila and Texas as follows:

> "In view of the great confusion and the misunderstandings that have arisen . . . because of the meaningless name of the Presidio of La Bahia del Espiritu Santo which is not at all appropriate, I beg that this august Congress declare the place a Town with the name Goliad, which is an anagram made from the surname (Hidalgo) of the heroic giant of our revolution . . ."

In reply, the Congress of Coahuila and Texas on February 4, 1829, decreed that "The fortress of La Bahia . . . may be called the town of Goliad . . ."

Work of the Mission

While the blood of soldiers and adventurers reddened the rocks of La Bahia, just across the river, at the mission, Franciscan friars worked ploddingly in the ways of peace.

When Mission Espiritu Santo was moved with Presidio La Bahia from Mission Valley to the San Antonio River, two of the more docile Indian tribes moved with it. Members of the Jaranames and Tamiques had been rather easy to civilize, taking their religious instruction and agricultural duties more or less seriously. But they came to the Goliad area with some fear and misgiving, for the move put them closer to their dreaded enemies, the fierce and warlike Karankawas.

Mission Espiritu Santo prospered, and became in time the owner of the largest cattle ranch in Spanish Texas, with its herds numbering high in the thousands. The main trouble was persuading even the peaceful Indians to remain at the mission when there was work to be done. During "working" seasons, when the prickly pear and pecans ripened, the Jaranames and Tamiques had a habit of fading into the brush. Discipline and religious instruction they accepted without a murmur, but work was a different matter.

Success and prosperity at Espiritu Santo led to a decision to establish another mission, Nuestra Senora del Rosario, nearby. The plan was to use this mission to convert and civilize the Karankawas, an ambitious and courageous undertaking.

Surprisingly enough, Rosario Mission prospered for a time, building up its own herds to some 30,000 cattle. But the Karankawa spirit was not easily adapted to peace. Such learning as the friars were able to impart to a few Indian leaders only backfired, as the Karankawas turned new-found knowledge to their own uses in the ways of war and treachery.

Troubles with Renegades

There was, for example, the infamous Jose Maria. He learned quickly, acquired a fluent command of Spanish, and became the pride of the mission fathers. Appointed an overseer, he commanded great respect among his people. But Maria found it hard to forget the bloody ways of his fathers.

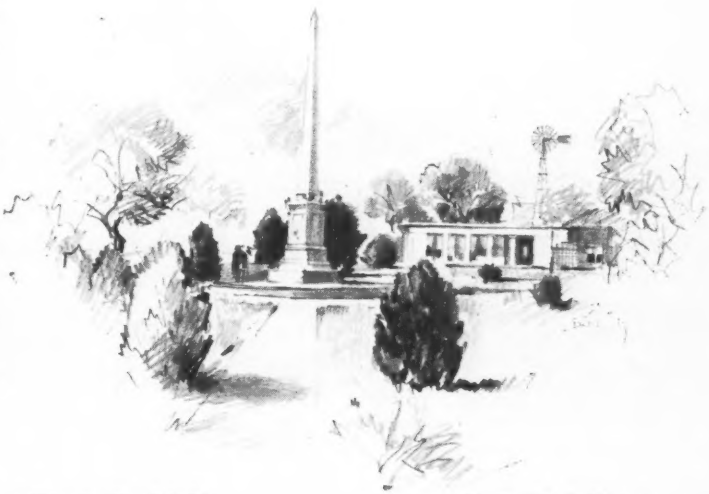
One day in 1778, Louis Landrin arrived by schooner from Louisiana to explore the Texas coast. Boarding the schooner with a band of Indians under the guise of friendship, Jose Maria was hospitably received with food and drink. Suddenly, at a signal, the Indians whipped out weapons and murdered Landrin with his entire crew. Later, when Spanish soldiers put Maria to death, his execution touched off a series of crime waves among the Indians, and wholesale desertions of the Spanish missions on the San Antonio.

After Maria's trouble-making came uprisings incited by Manuel Alegre, another Indian of Rosario Mission. Soldiers from La Bahia had to be called in to quell the Alegre troubles. A Karankawa chief, Frezada Pinta (Painted Blanket), always influenced his people to oppose the Spanish, but was subtler than his fellow renegades. He always managed to bring about a peaceful air among his people on those occasions when gifts were distributed at the mission.

When the Karankawas were not busy doing mischief at Rosario and Espiritu Santo Missions, they were fighting among themselves or locked in battle with their avowed enemies, the Comanches, Apaches, and Lipans. Guns were not hard to come by, with French and English traders eagerly supplying the demand for both sides, and the La Bahia garrison was often powerless to deal with the intertribal warfare.

Decline of the Missions

Eternal fighting and bickering worked against the missions. Many converts deserted to join their savage brothers, despairing of a philosophy that taught peace instead of war. Thousands of head of livestock were stolen, butchered, or driven off by the Indians. To make matters worse, the Spanish Crown now stood against the missions. Declaring them unnecessary, the Crown issued an edict that all unbranded cattle of the missions forthwith became the property of the King. As for financial help from Spain, not even the



Fannin Battlefield *by E. M. Schiwetz*

padre's annual pittance was paid. Texas missions were about to fall on evil days.

The beginning of the end came in 1794 when Spain decreed the secularization of all the Texas missions. This meant that the mission lands reverted to the government, and the missionaries were discharged. Rosario was abandoned in 1807, with its lands being distributed among Spanish settlers.

Mission Espiritu Santo continued to be used under the Mexican Republic after 1821, but fell into decay and finally was abandoned by the Indians. It was officially closed in 1830, when an inventory was made and the mission placed under the care of Geronimo Huizar, an official of La Bahia.

Remember Goliad

In the minds of most Texans, Goliad and La Bahia are best remembered for the part they played in the revolution against Mexico.

Late in 1835, Presidio La Bahia had fallen to the forces of Collingsworth and Ben Milam, the latter soon to be killed in his attack against San Antonio. After the fort was taken, it was placed in command of Philip Dimmit, whose company was composed largely of Irish fighters from Refugio and San Patricio.

Dimmit and his men, eager for Texas Independence, decided to make their own declaration—with or without authority. Marching to the parade grounds within La Bahia's famous quadrangle on December 20, they raised a flag of independence—a banner bearing a red and bloody arm brandishing a sword.

This hasty and unauthorized action caused displeasure among the Texas General Consultation, which had met at San Felipe, and served blunt notice to Mexico that Texans were getting ready to make their bid for freedom. It was not until several months later, on March 2, 1836, at Washington-on-the-Brazos, that the official Declaration of Independence was drawn up and signed by the Texas Constitutional Convention.

Events moved swiftly in Texas after the Declaration was signed. Just four days later, on March 6, the Alamo fell. Col. James W. Fannin and his troops at La Bahia (which Fannin called "Fort Defiance") were the only Texans left behind stone walls.

Hearing that settlers near Refugio were on the line of march of an attacking army, Fannin sent Captain Amon B. King with 28 men to bring them in. When King was placed under attack, Fannin sent Colonel William V. Ward and 120 men to rescue King. Neither rescue party survived.

Meanwhile, Sam Houston had ordered Fannin to blow up La Bahia and retreat to Victoria. Fannin demurred. When he did retreat, it was too late. He was caught with his force of about 350 men on an open plain near Coleto Creek, between Goliad and Victoria. Outnumbered and his case hopeless, Fannin surrendered, after a bitter battle, on March 20, 1836.

Exactly one week later, on Palm Sunday, Fannin's men were marched out a short distance from La Bahia's walls and shot. Their leader was accorded the honor of dying alone before a firing squad.

It was the last time blood would be drawn at La Bahia. With the death of Fannin and his men, the fort's long history of violence was ended. Less than a month afterward, Santa Anna was defeated at San Jacinto and Texas was free.

Goliad Today

The productive peace that surrounds Goliad today belies the violence that engulfed the area in earlier days. It seems difficult to believe that the place could have resounded for so many years to the cannon's roar and the battle's shout.

Mission Espiritu Santo, which fell into decay during the 19th Century, has been restored to full grace and beauty. And across the river, the remains of La Bahia rise in majesty and power atop their rockbound crag—peaceful now but still proud of the glory of command.

As a king of poetic justice, the only part of La Bahia in use today is the chapel, dedicated two centuries ago to Nuestra Senora de Loreto. Kept up through the years, the chapel now serves the surrounding community as a church.

Near the scattered ruins of the quadrangle walls, a stately monument marks the spot where Fannin sleeps with his martyred men.

Goliad Today *by E. M. Schiwetz*

Baytown's No. 2 Cat Cracker (center) helps produce high quality gasolines. At right are towers of the CLEU, or Catalytic Light Ends Unit, where gases produced by the Cats undergo more processing.

Baytown Expands Its Cat Crackers

Virtually all groups at Baytown Refinery can take some of the credit for expanding capacity of two cat crackers

JUST a little more than ten years ago, Baytown Refinery put its first fluid catalytic cracking unit "on stream." The unit was designed to process 13,400 barrels a day.

A second cat cracker, as the units are called, was placed in operation early in 1944. Design capacity of this one—an improvement over the first—was 16,000 barrels a day.

Today, each giant cat cracker can handle some 55,000 barrels a day. How did Baytown people manage to bring about such a thumping increase?

The answer to that question makes a stirring story of a joint venture, for virtually all groups at Baytown can take at least a piece of the credit for that expansion. It is a story of sound engineering . . . of cooperation and skill by mechanical crafts . . . of research that paid off . . . of process men who could meet new challenges . . . and of management's willingness to try new things; to take calculated risks if they bear good promise of success.

Smashing the Bottlenecks

Taken all together, the expansion of the two cat crackers is a story of Baytown Refinery's growth and self-improvement in a never-ending struggle to stay ahead of other refineries in the petroleum industry.

No sooner had the first cat cracker gone into production than men began to search for ways to increase its capacity.

Did it appear that a pump was too small for its job? They studied the possibility of taking it out, using it elsewhere, and replacing it with one or more larger ones.

Over and around the unit the critics went . . . searching always for things that might be done to send more oil and catalyst surging through the huge

vessels and the network of flow-lines. Satisfied with nothing, they took as their motto: "Nothing is so good it can't be made better."

And "make it better" they did. Here and there, a revision or rearrangement of pipes pushed a few more barrels of oil through the great 20-story monster. Air lines were enlarged, to keep greater quantities of oil and catalyst on the move. Heat exchangers in "pre-heat" service were so arranged that the oil coming into the unit would be hotter when it reached the furnaces. Anything that gave promise of adding a few barrels of capacity came in for a close scrutiny.

As a result of such projects, enough bottlenecks were smashed between 1943 and 1948 to increase No. 1 Cat Unit's capacity by more than 100 per cent!

And still the work went on. Results so far encouraged everyone, but there was still plenty to do. All agreed that the unit's ultimate capacity was far from reached.

Safer and Better

Next, in 1950, came a thorough study of certain heat exchangers—those whose job it was to remove heat from catalyst.

For one thing, these exchangers were examined under the glaring light of Humble's strict safety standards and found not quite acceptable. They had caused no fires or accidents, but trouble with them had led to an occasional downtime for the unit.

In the interest of better operation, and wanting to be on the safe side, Baytown people removed the debated exchangers. It proved an unexpected blessing. A study of necessary changes to get along without the exchangers led to a design for operations that actually increased capacity another 7000 barrels a day.

Thus was brought about not only a safer operation, but a better one. And there was yet an extra dividend. Removing the equipment and revising operations to suit pointed the way to possible increases beyond the 7000 barrels a day increase!

Bigger and Better Cyclones

Anywhere but in an oil refinery, cyclones are things to be feared and avoided. But in oil refineries, they are vital parts of cat cracking equipment. Placed in series or in clusters inside large vessels, cyclones are the tubes which separate catalyst from oil vapors after the cracking operation is complete.

Old-style cyclones were designed for fairly low rates and low velocity flow. Under high rates and high velocity operation, they eroded badly. Catalyst cut them as a file cuts steel, chewing them as full of holes as a Swiss cheese. As erosion grew worse, efficiency fell off. Now and then, a cat cracker had to be shut down to replace eroded cyclones.

Logically, then, the next step to push more oil through No. 1 Cat Cracker was to discard the old cyclones and replace them with a new and better model. Research and development had led to better cyclones that could handle higher velocity flow and larger volumes of the oil vapor-catalyst mixture. The larger cyclones permitted use of erosion-resistant materials inside them—a feature lacking in the old cyclones.

After the changeover from the old to the new cyclones, 6000 additional barrels a day went roaring through the great cat cracker. It was now up to the respectable charge rate of 40,000 barrels a day . . . not bad for something at first designed for only 13,400!

Still More Capacity

But more improvement was yet to come. This time, a complete engineering study was started on both units. With early successes behind them, with a growing knowledge of the care and feeding of cat crackers, and with expanded confidence in their ability to do things, men of Baytown began to go over each piece of equipment and phase of operations with a fine-toothed comb.

Figuratively speaking, every detail was put under the microscope, there to be studied critically. Equipment from the largest vessel down to the smallest pump and flow-line got a sharp-eyed once-over, then a thorough re-check, to see how production could be increased.

These questions remained upper-

CAT CRACKERS, AND WHAT THEY DO

Two fluid catalytic cracking units—impressive, multi-storied structures towering high above the rest of the plant—are the heart of Baytown Refinery. Someone defined the importance of the two units by saying: "As the cats go, so goes Baytown."

The two cat crackers take "gas oil" produced by pipe still distillation and crack it, or change its composition, in the presence of a powdery *catalyst*, into a number of high quality components.

Most of the products of the two cat crackers find their way into Humble's high quality gasolines. Others are such light gases (called "light ends") that they have to be sent to other units for further processing.

Products from those light ends are used to make butyl rubber (for inner tubes), butadiene (for tires), alkylate (for aviation gasoline), and other important materials.

Transfer line reactor, shown below, was a product of Baytown Refinery research. To save time, trouble, and money, it was thrust right up through shell of old reactor.

These old tanks furnished steel when a vital part of No. 1 Cat broke down and had to be replaced in a hurry.

Segments cut carefully from three tanks at left lie near No. 1 Cat, waiting to be hauled up and welded into vessel.

most in the searchers' minds: "What changes can we make? And how far can we go with those changes?"

Special emphasis was placed on possible modification of auxiliary equipment—such as pumps, furnaces, gas compressors, air blowers, and the like. Instrumentation was examined critically in an effort to open avenues toward smoother, better production. The one limiting factor on each proposed change was: Would it be *worth the money* to make the change? In refining, as in every other business, what is spent must be justified by what the investment will produce.

It was a study that produced some handsome results and led to some major changes. Another furnace was built, a large centrifugal gas compressor was installed, new pumps were added, and a great many flow lines were modified and enlarged. Here, for the first time in the continuous program of expansion, costs ran into big money. But it paid off. By virtue of the changes, No. 1 Cat Unit's capacity surged upward another 15,000 barrels a day, pushing to the 55,000-barrel mark.

Ingenuity Unlimited

One sidelight of the expansion program at No. 1 Cat Unit bears looking into. When the unit was brought down for repairs and changes in 1952—what refinery men call a "turnaround"—one major item of expense was replacing a large vessel, the catalyst stripper. In this vessel, some oil is removed from catalyst by steam injection.

With the unit down, inspectors and engineers began to go over it for trouble spots. They made a disturbing discovery. Just across the unit from the place where the new stripper would be installed, inspectors found another large vessel, with its related smaller ones, to be bulged and cracked.

What to do? After complete studies, the newest sources of trouble were declared operable for perhaps another six months or so—maybe a year, with good luck. But it was inevitable that the unit would have to be taken out of operation inside that time limit. And no one needed a crystal ball to tell the turnaround would be a long and costly one. Here was a dilemma—and some hard choices had to be made.

Either the unit could go back on stream after this downtime with the doubtful equipment, and then be shut down soon for another long turnaround—or a way *might* be found to fabricate, close at home, a substitute vessel to be installed during the current downtime. If the latter course could be worked out, it would save a great deal of money.

A completely new vessel, made to order and delivered to the jobsite in time, was out of the question. To order the steel, have it rolled and shaped, delivered to Baytown, and welded into the required vessel would take perhaps a year.

There was only one thing to do—find the steel close at hand and do a home-made job of it.

An immediate search of nearby sources failed to produce the steel. But there was still an ace in the hole: Look in Baytown's own backyard.

And that's where they found it. Close by No. 1 Pipe Still stood three old "hot tanks." They were riveted vessels and at least 20 years old. But a thorough inspection revealed that the hot tanks had grown old gracefully; their steel passed all tests. Moreover, they were just the right diameter —20 feet—so there needn't be any rerolling tasks.

The Work Begins

With the steel found, the work was just beginning. A corps of engineers put all other work behind them and addressed themselves steadily to the job of cutting out and putting together a vast jig-saw puzzle.

The problem, simply stated but not so simply solved, was to take the three hot tanks, cut out curved plates here and there, and fit the plates together again so as to make a welded vessel of precisely the right proportions.

Any housewife who has faced the task of making one new dress from three old ones has some knowledge of

Erosive action of catalyst knifed away these cyclones, or tubes in which catalyst becomes separated from the oil.

New-type cyclones are larger, handle higher velocity flow, resist erosion better, and add to capacity of the two cats.

the problems involved. But no housewife is likely to face quite such a job of figuring, down to the smallest detail, all the supports, stresses, strains, and other calculations necessary in this engineering brain-teaser. It was many weeks before the job was completed, and many an engineer would have welcomed a chance to buy his aspirins wholesale.

No one was surprised when the home-made vessel did everything it was supposed to do—even better than it was supposed to do. With typical Baytown ingenuity, one vessel had been made to combine the work of several. For in making up the patchwork vessel, design was changed to incorporate the usual companion (and smaller) vessels into the one large one. End result of the 4-in-one piece of equipment was a better operation than the unit had before.

It wasn't just luck. It was a good engineering job, good design work, and a lot of hard work. Anyone who worked on the project will tell you it wasn't easy. But in the telling, he will understandably find it difficult to conceal pride for his share in a job well done.

Research to the Fore

While others worked steadily, in their own way, to increase cat cracking capacity, research men at the "Kitty Cracker" (a smaller pilot unit for study of cat cracker operations) were devoting themselves to the same problem.

These men were vitally interested in the reaction that takes place when oil and catalyst meet. On the large units, reactors are huge, wide vessels; oil and catalyst mixture swirls rather slowly through them.

Researchers reasoned this way: Could not the reaction take place under more favorable circumstances in a narrower space, at higher velocities? They put their theory to the test, using a pilot-sized reactor—a pipe just an inch in diameter.

Results were good. Product distribution from the experiment gave an even greater proportion of the more desirable oils. But what would happen when the one-inch test reactor was scaled up to one many feet in diameter? No one knew. But at least the experiment gave promise of success, if all could be persuaded to take the chance.

An Entirely New Design

After longer and more complete studies, enough evidence was at hand to give management reasonable assurance of success. An entirely new-design reactor was built and installed at No. 1 Cat Cracker. Actually, it was more of a big line than a vessel like the old reactor, and earned the title of "transfer line reactor." If it worked, all to the good. If not, time and money were lost.

It worked. Ever since the unit went back on stream in September of 1952, the reactor developed from the Kitty Cracker's one-inch pipe has proved its worth in the big unit. Baytown research had scored again.

With a radically new reactor, a new catalyst stripper, and a home-made regenerated catalyst hopper—not to speak of scores of other changes of smaller nature—No. 1 Cat Cracker when it went back into service bore little resemblance to its old self. So many changes had been made that the unit was almost a stranger to those who worked on it.

Up came another problem—that of training men to cope with the operation of this virtual stranger. The training job began early. Process crews were brought back on the job (they had worked elsewhere in the refinery during the downtime) and made themselves familiar with the changes. Actual classroom studies were held on the job—to trace new flow systems, study new heating problems, acquaint everyone with the location and use of new equipment, and get ready for bringing the face-lifted unit back into production.

That early start and the classroom work paid off handsomely. For expansion brought on its difficulties, as well as its blessings. It was somewhat more difficult for the process men to operate the unit at increased rates. For one thing, there was more equipment to handle. Control instruments, especially, had to do precisely what they were supposed to do—or the unit did not operate properly. One balky instrument could throw the whole unit off course.

Expansion posed new maintenance problems, too. Simply speaking, there was more for maintenance men to maintain. Also, the work of expansion had

increased the difficulties of maintaining equipment.

But as always, cooperation among Baytown people smoothed out the rough spots. It was not long before all hands were as comfortably at home with the new cat as they had been with the old one.

Expansion at No. 2

Few of the changes made to increase No. 2 Cat Cracker's capacity were quite as radical as those made at its companion unit. Through the same pattern of study and change and modification, No. 2's capacity was pushed upward in about the same proportion as No. 1's.

Removal of bottlenecks by changing and substituting equipment between 1944 and 1948 increased capacity from 16,000 to 38,000 barrels a day. Modern cyclones added another 1,000 barrels. The same sort of detailed engineering study brought on the biggest increase—an extra 16,000 barrels a day, up to a daily total of 55,000 barrels.

The Ripple Widens

The effect on other refinery operations of expanding cat cracker capacity might be compared with the ripples a stone makes when dropped into a pool of water. Influence of the change spread in a widening circle to other processes, creating a need for other expansion.

Hooking up a new line at one of the cat crackers. Job of expanding capacity at the two units was one that brought into play all the different skills of many craftsmen.

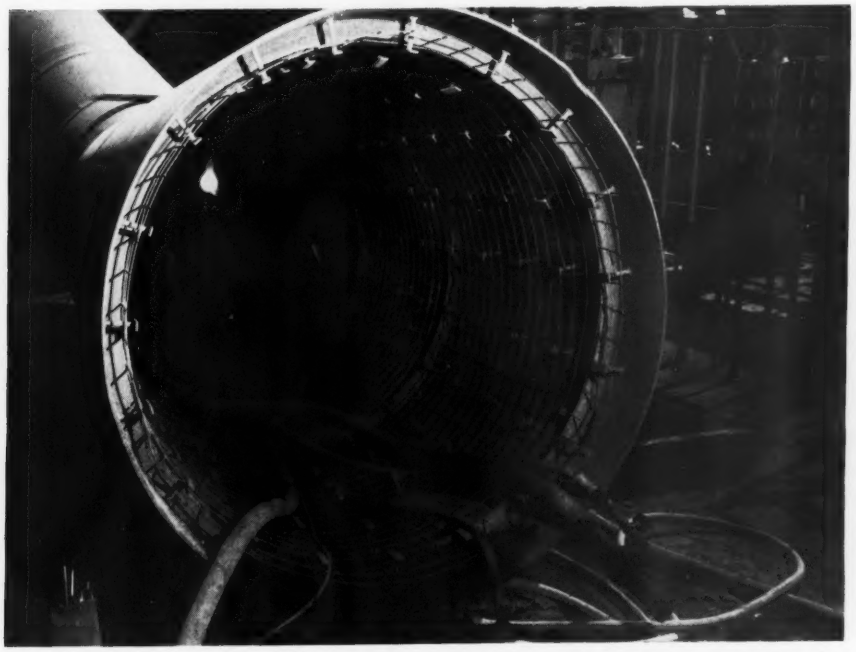
For example, with cracking capacity up, the two cat crackers needed more "feed stock" to crack. This will be provided when a deasphalting plant, now under construction, is completed. The plant will take thick black "bottoms" from pipe stills, remove the asphalt from them, and convert the remainder to good quality gas oil for use as cat cracker feed.

Just as more feed stock was needed, so were added facilities to handle what the cats produce. One unit (the CLEU, or catalytic light ends unit) was already in production to recover light gases from the cats and separate them into more usable materials. Products from the CLEU, in turn, are used as feed stocks by the butyl rubber plant, the butadiene plant, and the alkylation plant.

With the cat crackers turning out more light ends, the CLEU was "running wide open," producing at just about its top capacity. Another such unit was needed, and ground for it was being broken as this article went to press.

Thus it is that a major expansion of a key process like catalytic cracking makes itself felt all over the refinery. So profound is its influence on other processes that expansion in one direction must be followed by expansion in others.

That is the growth pattern, the improvement pattern, of a refinery so large and complex as Baytown. In the final analysis, it is an expansion that will mean more jobs for Humble people, more and better products for millions of consumers who depend more and more upon oil, and surer ground for Baytown to stand on in its efforts to "stay ahead" in a highly competitive industry.



No horn of plenty, but one through which plenty of oil and catalyst will flow. Insulating lines on the inside greatly reduces erosion, keeps unit in operation longer.

Twenty-two Employees Retire

Combined credited time with Humble represents 590 years of service

TWENTY-TWO long-time employees of the Humble Companies have retired since the last issue of THE HUMBLE WAY. Their combined credited time with Humble represents 590 years of service. Twenty of these new annuitants have 23 or more years' service. O. F. Carroll, assistant treasurer, in the Houston office, has the longest period of service among this group with his more than 34 years. John P. Goyen, chief clerk in the East Texas Division Office, has 33 years with Humble.

Humble Pipe Line Company—Ernest E. Mulloy, engineer at Gilmer Station, retired November 10 after almost 27 years' service. Mr. Mulloy was employed as a rotary helper at Webster. Later he worked as a riveter, painter, caulker, laborer, linewalker, gangman, oiler, and engineer. His hobby is truck gardening. He will keep a cow and chickens and raise a garden near Gilmer, Texas.

August L. Schmidt, terminal gauger at Webster Station, retired November 6 after more than 32 years' service. He started to work for the Company as a hotel helper. All of his service has been at Webster, and he is one of the first men to help move crude oil in and out of that station. He likes hunting coons and raising cattle. During retirement, he plans to work more at these hobbies.

Philip H. Stark, oiler at Satsuma Station, retired October 25 after more than 25 years' service. He began work as a laborer at Navasota. Later he moved to Bryan and Satsuma. He owns his home in Cypress, but he may move to Bryan.

Richard Thomas, welder special at Cisco, retired October 26 after 29 years' service. He was employed at Chaney Camp as pipe liner; he moved to Cisco in 1927. Woodworking is his hobby. On retirement, he will make his home in Cisco.

Thomas O. Thomas, mechanical supervisor at Cisco, retired November 5 after more than 31 years' service. He began work with the Company as a laborer at Ward. Later he worked at Chaney, Ranger, and Cisco. His special interest is his home and yard.

Production Department—William W. Culver, garage helper at the Houston Garage, retired October 29 after more than 26 years' service. He was employed as a laborer in Houston. Later he worked as a sign painter, repairman, material inventory clerk, material equipment man, assistant warehouseman, tank truck loader, and garage helper. He likes fishing and gardening as hobbies. During retirement, he will do some fishing and raise a garden in Peekskill Lane, where he is now building a home.

John P. Goyen, chief clerk in the East Texas Division Office, retired December 1 after 33 years' service. He started to work as a timekeeper for Humble at Cisco and later worked at Mexia, Corsicana, and Powell before moving to Tyler in 1931. His hobby is fishing. During retirement, he hopes to go into the real estate business.

Frank Jousan, Jr., lease pumper-gauger at Galveston Bay, retired December 5 after 19 years' service. Mr. Jousan began work with the Company as a roustabout at Thompsons. He has also worked as a truck driver and painter. In 1951 he received a Coin-Your-Idea award for suggesting an improvement in making daily production gauges of stock tanks. He includes fishing among his special interests. He plans to raise a garden and chickens at his home in Sealy, Texas.

Millard F. Villyard, lease pumper-gauger at London, retired December 7 after more than 23 years' service. He was employed at Humble, Texas, as a pumper and has worked also as a gauger and roustabout. He is a sports fan and likes to read. During retirement, he plans to raise a garden and chickens at his place near Overton, Texas.

Baytown Refinery — Charles C. Delano, instrument supervisor, retired November 1 after more than 28 years' service. He worked in the Pipe, Machine, and Boilermaker Departments before he went into the Instrument Department. He will pursue his hobbies of hunting and raising cattle.

Ham L. Elder, separator pumper, retired December 1 after more than 23 years' service. Mr. Elder worked as a boilermaker helper and laborer before transferring to the Docks, where he

held numerous classifications while employed there. His hobby is making hunting horns. He plans to live near Cleveland, Texas, and raise cattle.

Jesse C. Lanier, relief pumper, retired November 11 with more than 23 years of service. He began work with the Company as a laborer in the Labor Department. He later moved to Pumping and Gauging. His hobbies are hunting, fishing, and traveling. He expects to do some carpentering, painting, and paper hanging in retirement.

George T. McCormick, handyman, retired October 18 after more than 26 years' service. Mr. McCormick began work as a helper with the Boilermakers and later transferred to the Machine Department. He includes dominoes among his special interests. He hopes to purchase a small place near Baytown, where he can raise vegetables during retirement.

Charles A. McDonald, gang pusher first, retired November 26 with more than 26 years' service. All of his service with Humble has been at Baytown Refinery. He likes fishing as a hobby. On retiring, he plans to do some visiting with his children.

James F. Shepherd, supervisor, retired November 1 after more than 30 years' service. Mr. Shepherd was employed as a rigger helper in the Rigging Department. Later he transferred to the Garage as a tractor driver and held various jobs until he became supervisor. His special interests include hunting, fishing, and baseball. He hopes to buy a small place in the country, where he can raise flowers, garden, and some cattle.

Newman C. Smith, separator pumper, retired October 25 after more than 22 years' service. All of his service has been at the Refinery in the Boilermaker, Labor, and Docks Departments. His hobby is fishing.

Reagan H. Webb, handyman, retired November 13 after more than 27 years' service. He began work as a helper in the Boilermaker Department; later he worked in the Time Office, Labor, and Paint Departments before going to the Machine Department. He likes gardening. During retirement, he plans to sell insurance.

Grover C. Weisinger, blender, retired November 10 after more than 29 years' service. Before becoming a blender in the OM-Blending Department, he worked as a laborer, janitor, and tester. Mr. Weisinger helped to blend the "Billionth" gallon of aviation gasoline run by Humble December 14, 1944. He includes raising flowers among his special interests. He will remain in Baytown, but he plans to do some traveling.

Sales Department — Oscar H. Goedicke, maintenance mechanic in the Southeast Texas Division Office, retired November 1 with almost 25 years' service. He started to work as a mechanic and later worked as pumper-mechanic, maintenance man, and mechanic. He likes to fish. He owns a home in Houston. Mr. Goedicke says, "I plan to do what I want to do when I want to do it and just enjoy living."

Houston Office—Winfred J. "Judge" Barnes, lawyer in the Law Department, retired November 19 after 23 years' service. All of his service with Humble has been in the Law Department. Judge Barnes was placed in charge of the Special Officer group when it started. He is among the original organizers of the Humble Employees Federal Credit Union. Part of his duties included advising the Building Manager and the Credit Union on matters of law. He has also acted as adviser to the Humble Club as well as to individual employees. He includes among his special interests teaching a Sunday School class and bowling. During retirement, he plans to travel some and look after a farm and ranch and other private interests. He will also be available for consultation work.

Oscar F. Carroll, assistant treasurer, retired December 3 after more than 34 years' service. He began work with Humble as an accounting clerk in the Production Department. Before joining the Company, he was traveling auditor for Santa Fe Railway. On January 1, 1920, he was named head of Humble's Production Payroll. On February 14, 1938, he was elected assistant treasurer. During 1928, Mr. Carroll was editor of the Humble Club BULLETIN; the next year he was elected president of the Club but was unable to serve because of other duties. He owns a farm near Missouri City, Texas, where he plans to pursue his hobbies of raising flowers, fishing, and hunting.

Syril J. Young, statistician in Annuities and Benefits Division, retired November 3 after more than 30 years' service with the Company. He joined Humble as a clerk in Production Accounting. On February 1, 1937, he started to work in the Annuities and Benefits Division. Cy Young was one of the mainstays of the noted Humble Club baseball team that existed from 1921 to 1927. During 1925 the group played 26 games and won 25, taking five championships. He played third base, outfield, and on occasions pitched for the team. He plans to live near Edna, Texas, and pursue his favorite hobbies of hunting and fishing.

Deaths

Since the last issue of THE HUMBLE WAY, twelve active employees and five annuitants have died.

Active employees who have died are: Benjamin T. Andrews, 56, lease pumper-gauger at Kelsey District, on October 9; George N. Byrd, 47, helper at Baytown Refinery, on October 3; Joseph D. Darby, 28, laborer at Baytown Refinery, on October 26; William H. Dommert, 52, toolroom man at Baytown Refinery, on October 2; Fred M. Hamman, 44, helper at Baytown Refinery, on November 20; Fred Harris, 51, district clerk in Production Operating at the Houston Office, on October 27; James N. Harvey, 54, lease pumper-gauger at Conroe, on October 28; Orval L. Johnson, 51, stock gauger at Webster Station, on October 12; Edward E. Metzler, 64, utility man at the Houston Fuel Oil Terminal, on October 17; John H. Painter, 50, helper first at Baytown Refinery, on October 16; Sammie R. Smith, 51, lease pumper-gauger at London, on November 2; Albert J. Vaughan, 50, lease pumper-gauger at Winters, on November 18.

Annuitants: Joseph L. Allcorn, 74, pipe machine operator helper at Friendswood before his retirement, died on October 31; Thomas E. Cooper, 70, head stock gauger at San Angelo Station before his retirement, died on November 4; Tom J. Darrah, Jr., 61, claim agent in Exploration-Geophysics, New Mexico, before his retirement, died on October 21; James R. Reid, 67, roustabout gangpusher at Hardin before his retirement, died November 8; Monroe V. Roberts, 67, roustabout gangpusher before his retirement, died on October 22.

By the way...

NAMED ASSISTANT TREASURER

● Leonard W. Groce on December 19 was named Assistant Treasurer of Humble Oil & Refining Company, with supervision over the banking section. His new duties include the receiving and disbursing of Company funds and the maintenance of relations between Humble and a number of banks.

Mr. Groce joined Humble in 1934, after completing two years of study at Massey Business College. He first worked in the Treasury Department section which handled employee stock purchases. When Humble's Annuity and Thrift Plan was organized in 1936 to replace the earlier stock purchase system for employees, he became a member of the section which administers the plan.

GROCE

In 1945 Mr. Groce was transferred to the banking section of the Treasury Department, and became Assistant Cashier of the Company. He held that post until his new appointment.

COMPLETES 40 YEARS

STEPHENS

● Roy M. Stephens, assistant manager of Humble Oil & Refining Company's Sales Department, received his forty years' service pin on December 15.

Mr. Stephens' career in the petroleum industry closely parallels the progress of oil-powered transportation through the years. He was born in 1894 on a farm in Orange County, five years before the first motor vehicle was driven over Texas roads.

In 1912 Mr. Stephens completed a business course and went to work for the Bonner Oil Company as a service station salesman at the first curb gasoline pump in Houston.

Mr. Stephens entered Humble's accounting department in 1919 when the Company purchased the Bonner Oil Company. In 1923 he was made assistant to J. S. Bonner, then vice president and general manager of sales.

He moved up through sales supervisory positions until, in 1932, he became manager of Houston Office sales. In 1945 he became assistant sales manager responsible for over-all Sales Department operations.

Mr. Stephens served as state chairman of the Oil Industry Information Committee in 1951 and 1952, and was recently named vice chairman of the Gulf Southwest District of the O.I.I.C., which includes several states.

A.P.I. REPORTS NEW INDUSTRY HIGHS

● Production, processing, and distribution of petroleum set another all time high record in 1952, according to an American Petroleum Institute year-end report. Domestic demand was approximately two billion 650 million barrels, a three per cent increase over the previous high set in 1951.

More crude oil, natural gas liquids, natural gas, motor fuel, and distillate fuel oil were produced than in any other 12-month period, the report shows. Refinery capacity and the amount of crude oil processed in refineries reached all-time peaks; and to help meet current demands and prepare for tomorrow's, a record breaking number of wells were drilled.

THE COVER

● In the attractive water color painting of Presidio La Bahia, artist E. M. Schiwetz captures the beauty and grandeur of the old Goliad landmark. His pencil sketches on Pages 11-16 record some of the other historic monuments in the area.

The HUMBLE WAY

Vol. VIII No. 4

NOVEMBER-DECEMBER
1952

Humble is a Good Customer..... 1

The Oil Elevator..... 4

Completing Wells for Keeps..... 8

The Goliad Trinity.....11

Pencil Sketches by E. M. Schiwetz

Baytown Expands its Cat Crackers..17

Twenty-two Employees Retire.....22

By the way.....24

Published every other month for employees and stockholders

HUMBLE OIL & REFINING COMPANY

P. O. Box 2180, Houston 1, Texas

Board of Directors

L. T. Barrow, *Chairman*

Hines H. Baker — Rex G. Baker
David Frame — H. W. Ferguson
D. B. Harris — Morgan J. Davis
J. A. Neath — C. E. Reistle, Jr.
Richard J. Gonzalez

Officers

Hines H. Baker, *President*
L. T. Barrow, *Chairman*
David Frame, *Vice President*
D. B. Harris, *Vice President and Treasurer*
J. A. Neath, *Vice President*
Rex G. Baker, *Vice President and General Counsel*
H. W. Ferguson, *Vice President*
Morgan J. Davis, *Vice President*
Gay Carroll, *Comptroller*
H. K. Arnold, *Secretary and Assistant Treasurer*
Nelson Jones, *General Attorney*

Permission for reproduction of articles and pictures contained herein will be granted freely if credit is given and the request is made of the Editor, The Humble Way, P. O. Box 2180, Houston 1, Texas.

Picture Credits: Inside front cover and pages 4 through 6 by Tommy Nowlin; pages 8 through 10, courtesy Schlumberger Well Surveying Corporation; pages 17 through 21, Reproduction Section, Baytown Refinery; inside back cover by Mel Coston.

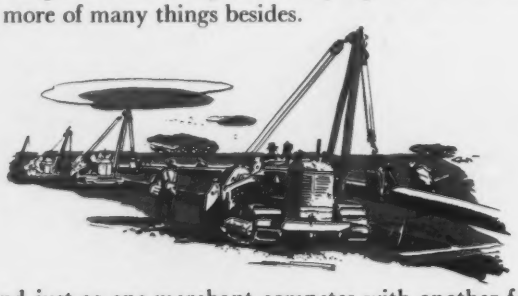
Art Credits: Pages 1 through 3 and top of page 11 by Harris Goode; front cover and pages 12 through 16 by E. M. Schiwetz; page 7 by R. E. Dunn.

Baytown Refinery's two fluid catalytic cracking units (No. 2 in left background). Refinery people have increased total capacity at the two units from about 30,000 barrels a day to more than 100,000. See "Baytown Expands its Cat Crackers."

Competition is the life of the OIL BUSINESS

The demand for oil increases every year.

Americans need more oil for more automobiles, for more airplanes, more ships, more high speed locomotives and more of many things besides.



And just as one merchant competes with another for your business, oil companies compete for it, too—for the gallons of gasoline and quarts of motor oil you buy; to supply the ships, the locomotives, the industries, the airplanes.

The competition is intense, and it spreads throughout the industry. Oil companies compete with each other to find and produce more oil. Pipe line companies vie with each other to develop low cost transportation. Refineries compete to supply more and better oil products. Salesmen compete on the basis of quality products and the service rendered.

It's a good thing, this competition, a healthy thing. It is the life of the oil business; it keeps the industry vigorous, progressive, enterprising.

But its chief benefit is to you and other Americans. Competition within the oil industry discovers and develops a natural resource necessary not only to modern living but to national defense. It supplies you and the country with continuously improved petroleum products; today, two gallons of gasoline do work that required three in 1925, but the gasoline costs no more than it did then.

HUMBLE OIL & REFINING CO.
HUMBLE PIPE LINE CO.

(This advertisement is one of a series which has been appearing in newspapers and magazines in the territory in which Humble carries on its operations.)